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Infinity Sciences

Overview of Cloud Computing Towards to Future Networks

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Abstract- The purpose of this paper is to clear up some of the mystery surrounding the topic of cloud computing. Cloud computing it is about to change your applications and documents are going to move from the desktop to the cloud. You can take your work anywhere because it's always accessible via the web. In addition, cloud computing facilitates group collaboration, as all group members can access the same programs and documents from wherever they happen to be located.

Keywords**:** *Cloud Computing, Infrastructure, Cloud technologies, Future Networks.*

I. INTRODUCTION

Cloud computing portends a major change in how to store information and run applications. Instead of running programs and data on an individual desktop computer, everything is hosted in the "cloud"—a nebulous assemblage of computers and servers accessed via the Internet. Cloud computing lets you access all your applications and documents from anywhere in the world, freeing you from the confines of the desktop and making it easier for group members in different locations to collaborate. Advances in networking technology and an increase in the need for computing resources have prompted many organizations to outsource their storage and computing needs. This new economic and computing model is commonly referred to as cloud computing. [1]

Cloud Computing (CC) might sound far-fetched, but chances are you're already using some cloud applications. If you're using a web-based email program, such as Gmail or Hotmail, you're computing in the cloud. If you're using a web-based application such as Google Calendar or Apple MobileMe, you're computing in the cloud. If you're using a file- or photo-sharing site, such as Flickr or Picasa Web Albums, you're computing in the cloud. It's the technology of the future, available to use today. How does cloud computing work? What does cloud computing mean for the way you use a computer? What are the top cloud computing applications? [2, 3]

This paper provides some answers to the problem associated with the understanding the characteristics and performance of cloud computing, arising from the rapid introduction and use of the new technology. We will introduce the basic tools for CC, and then we see the most Models solutions development in this area.

We will offer a brief introduction and then we review some of the common questions that may be when many researchers about what cloud computing such as the Understanding the Cloud Computing, Cloud Computing Defined, What Is the Cloud, What Are the Key Characteristics of Cloud Computing, A Short History of Cloud Computing, Understanding Cloud Architecture, How users connect to the cloud. The advantages of Cloud Computing, Disadvantages of Cloud Computing, Who Shouldn't Be Using Cloud Computing, all this question's

will be explained in section II, what is the Service models, Types of Cloud Service Development, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Deployment models and it types, Others models, will be explained in section III, In section IV. We will provide a Cloud Computing for everyone, and explain the Cloud Computing for the Community, Cloud Computing for the Corporation, In Section V. Will interest to answer the question of what is the Future. We will end this paper by conclusion.

II. UNDERSTANDING CLOUD COMPUTING

In Cloud computing portends a major change in how we store Information and run applications. Instead of running programs and data on an individual desktop computer, everything is hosted in the "cloud"—a nebulous assemblage of computers and servers accessed via the Internet. Cloud computing lets you access all your applications and documents from anywhere in the world, freeing you from the confines of the desktop and making it easier for group members in different locations to collaborate.

With traditional desktop computing, you run copies of software programs on each computer you own. The documents you create are stored on the computer on which they were created. Although documents can be accessed from other computers on the network, they can't be accessed by computers outside the network.

With cloud computing, the software programs you use aren't running from your personal computer, but are rather stored on servers accessed via the Internet. If your computer crashes, the software is still available for others to use.

Same goes for the documents you create; they're stored on a collection of servers accessed via the Internet. Anyone with permission can not only access the documents, but can also edit and collaborate on those documents in real time. Unlike traditional computing, this cloud computing model isn't PC centric, it's document-centric. Which PC you use to access a document simply isn't important. But that's a simplification. Let's look in more detail at what cloud computing is—and, just as important, what it isn't. [4, 5, 6]

- **Cloud Computing Defined**

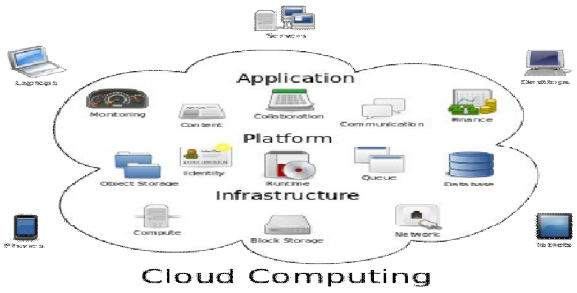

Fig. 1

In an October, 2009 presentation titled "Effectively and Securely Using the Cloud Computing Paradigm,"3 by Peter Mell and Tim Grance of the National Institute of Standards and Technology (NIST) Information Technology Laboratory, cloud computing is defined as follows:

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., Networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models." [7, 8].

- **What Is the Cloud?**

Key to the definition of cloud computing is the "cloud" itself. For our purposes, the cloud is a large group of interconnected computers. These computers can be personal computers or network servers; they can be public or private. For example, Google hosts a cloud that consists of both smallish PCs and larger servers. Google's cloud is a private one (that is, Google owns it) that is publicly accessible (by Google's users). This cloud of computers

extends beyond a single company or enterprise. The applications and data served by the cloud are available to a broad group of users, cross-enterprise and cross-platform. Access is via the Internet. Any authorized user can access these docs and apps from any computer over any Internet connection. And, to the user, the technology and infrastructure behind the cloud is invisible. It isn't apparent (and, in most cases doesn't matter) whether cloud services are based on HTTP, HTML, XML, JavaScript, or other specific technologies. It might help to examine how one of the pioneers of cloud computing, Google, perceives the topic. From Google's perspective, there are six key properties of cloud computing:

- Cloud computing is user-centric. Once you as a user are connected to the cloud, whatever is stored there documents, messages, images, applications, whatever becomes yours. In addition, not only is the data yours, but you can also share it with others. In effect, any device that accesses your data in the cloud also becomes yours.
- Cloud computing is task-centric. Instead of focusing on the application and what it can do, the focus is on what you need done and how the application can do it for you., Traditional applications word processing, spreadsheets, email, and so on are becoming less important than the documents they create.
- Cloud computing is powerful. Connecting hundreds or thousands of computers together in a cloud creates a wealth of computing power impossible with a single desktop PC.
- Cloud computing is accessible. Because data is stored in the cloud, users can instantly retrieve more information from multiple repositories. You're not limited to a single source of data, as you are with a desktop PC.
- Cloud computing is intelligent. With all the various data stored on the computers in a cloud, data mining and analysis are necessary to access that information in an intelligent manner.
- Cloud computing is programmable. Many of the tasks necessary with cloud computing must be automated. For example, to protect the integrity of the data, information stored on a single computer in the cloud must be replicated on other computers in the cloud. If that one computer goes offline, the cloud's programming automatically redistributes that computer's data to a new computer in the cloud. [1, 3]

- **What Are the Essential Characteristics of Cloud Computing?**

There are several key characteristics of a cloud computing environment, On-demand self-service. A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider. Broad network access. Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops, and PDAs). Resource pooling. The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction. Examples of resources include storage, processing, memory, network bandwidth, and virtual machines. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time. Measured Service. Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service. [7]

- **A Short History of Cloud Computing**

Cloud computing has as its antecedents both client/server computing and peer-to-peer distributed computing. It's all a matter of how centralized storage facilitates collaboration and how multiple computers work together to increase computing power.

- Client/Server Computing: Centralized Applications and Storage
- Peer-to-Peer Computing: Sharing Resources
- Distributed Computing: Providing More Computing Power
- Collaborative Computing: Working as a Group

The concept of cloud-based documents and services took wing with the development of large server farms, such as those run by Google and other search companies. Google already had a collection of servers that it used to power its massive search engine; why not use that same computing power to drive a collection of web-based applications—and, in the process, provide a new level of Internet-based group collaboration? [1, 2]

- **Understanding Cloud Architecture**

The key to cloud computing is the "cloud" a massive network of servers or even individual PCs interconnected in a grid. These computers run in parallel, combining the resources of each to generate supercomputing-like power.

What, exactly, is the "cloud"? Put simply, the cloud is a collection of computers and servers that are publicly accessible via the Internet. This hardware is typically owned and operated by a third party on a consolidated basis in one or more data center locations. The machines can run any combination of operating systems; it's the processing power of the machines that matter, not what their desktops look like.

Individual users connect to the cloud from their own personal computers or portable devices, over the Internet. To these individual users, the cloud is seen as a single application, device, or document. The hardware in the cloud (and the operating system that manages the hardware connections) is invisible.

- **How users connect to the cloud.**

This cloud architecture is deceptively simple, although it does require some intelligent managed to connect all those computers together and assign task processing to multitudes of users. It all starts with the front-end interface seen by individual users. This is how users select a task or service (either starting an application or opening a document). The user's request then gets passed to the system management, which finds the correct resources and then calls the system's appropriate provisioning services.

These services carve out the necessary resources in the cloud, launch the appropriate web application and either creates or opens the requested document.

After the web application is launched, the system's monitoring and 3metering functions track the usage of the cloud so that resources are apportioned and attributed to the proper user(s).[6]

As you can see, the key to the notion of cloud computing is the automation of many management tasks. The system isn't a cloud if it requires human management to allocate processes to resources. What you have in this instance is merely a twenty-first-century version of old-fashioned data center–based client/server computing. For the system to attain cloud status, manual management must be replaced by automated processes.

- **The Advantages of Cloud Computing:**

We'll start with the advantages offered by cloud computing—and there are many.

- Lower-Cost Computers for Users
- Improved Performance
- Reduced implementation and maintenance costs
- Increased mobility for a global workforce
- Flexible and scalable infrastructures
- Quick time to market
- IT department transformation (focus on innovation vs. Maintenance and implementation)
- "Greening" of the data center
- Increased availability of high-performance applications for small/ medium-sized businesses.

- **Disadvantages of Cloud Computing:**

That's not to say, of course, that cloud computing is without its disadvantages. There are a number of reasons why you might not want to adopt cloud computing for your particular needs. Let's examine a few of the risks related to cloud computing.

- Requires a Constant Internet Connection
- Doesn't Work Well with Low-Speed Connections
- Features Might Be Limited
- Stored Data Might Not Be Secure
- If the Cloud Loses Your Data, You're screwed.

- **Who Benefits of Cloud Computing?**

Let's face it, cloud computing isn't for everyone. What types of users, then, are best suited for cloud computing and which aren't?

- Collaborators
- Road Warriors
- Cost-Conscious Users
- Cost-Conscious IT Departments
- Users with Increasing Needs

- **Who Shouldn't Be Using Cloud Computing?**

Now let's look at the flip side of the coin. If cloud computing isn't for everyone, who isn't it fair?

- The Internet-Impaired
- Offline Workers
- The Security Conscious
- Anyone Married to Existing Applications

III. Service models

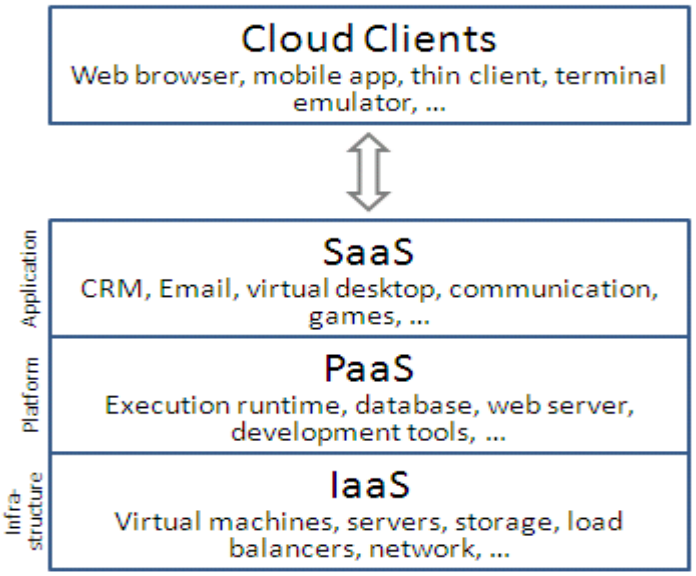

Fig. 2

As technology migrates from the traditional on premise model to the new cloud model, service offerings evolve almost daily. Our intent in this chapter is to provide some basic exposure to where the field is currently from the perspective of the technology and give you a feel for where it will be in the not-too-distant future.

- **Types of Cloud Service Development**

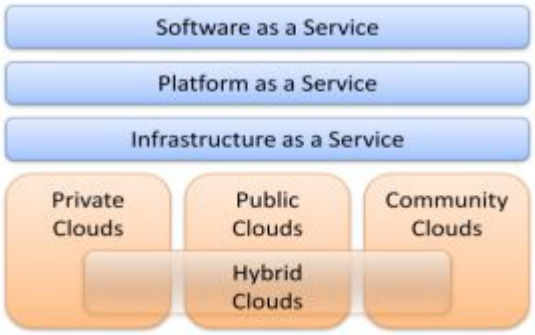

Fig. 3

Device and location independence enables users to access systems, regardless of where they are or what device they are using. Now, let's examine some of the more common web service offerings.

1- Infrastructure-as-a-Service (IaaS)

The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems; storage, deployed applications, and possibly limited control of select networking components (e.g., host firewalls). [7]

IaaS providers manage the transition and hosting of selected applications on their infrastructure. Customers maintain ownership and management of their application(s) while off-loading hosting operations and infrastructure

management to the IaaS provider. Provider-owned implementations typically include the following layered components:

- Computer hardware (typically set up as a grid for massive horizontal scalability)
- Computer network (including routers, firewalls, load balancing, etc.)
- Platform virtualization environment for running client-specified virtual machines
- Service-level agreements
- Utility computing billing

Rather than purchasing data center space, servers, software, network equipment, etc. As customers essentially rent those resources as a fully outsourced service. Usually, the service is billed on a monthly basis, just like a utility company bills customers. The customer is charged only for resources consumed. The chief benefits of using this type of outsourced service include:

Ready access to a preconfigured environment that is generally ITIL-based (The Information Technology Infrastructure Library [ITIL] is a customized framework of best practices designed to promote quality computing services in the IT sector.)

- Use of the latest technology for infrastructure equipment
- Secured, "sand-boxed" (protected and insulated) computing platforms that are usually secured monitored for breaches
- Reduced risk of having off-site resources maintained by third parties
- Ability to manage service-demand peaks and valleys

2- Platform-as-a-Service (PaaS)

The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations. [7]

Cloud computing has evolved to include platforms for building and running custom web-based applications, a concept known as Platform-as-a- Service. The pass is an outgrowth of the SaaS application delivery model. The PaaS model makes all of the facilities required to support the complete life cycle of building and delivering web applications and services entirely available from the Internet, all with no software downloads or installation for developers, IT managers, or end users. Unlike the IaaS model, where developers may create a specific operating system instance with homegrown applications running, PaaS developers are concerned only with web based development and generally do not care what operating system is used. PaaS services allow users to focus on innovation rather than complex infrastructure. Organizations can redirect a significant portion of their budgets to creating applications that provide real business value instead of worrying about all the infrastructure issues in a roll-your-own delivery model.

3- Software-as-a-Service (SaaS)

Cloud Software as a Service (SaaS). The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email). The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings [7].

Software as a service, or SaaS, is probably the most common type of cloud service development. With SaaS, a single application is delivered to thousands of users from the vendor's servers. Customers don't pay for owning the

software; rather, they pay for using it. Users access an application via an API accessible over the web. Each organization served by the vendor is called a tenant, and this type of arrangement is called a multitenant architecture. The vendor's servers are virtually partitioned so that each organization works with a customized virtual application instance. For customers, SaaS requires no upfront investment in servers or software licensing.

- **Deployment models:**

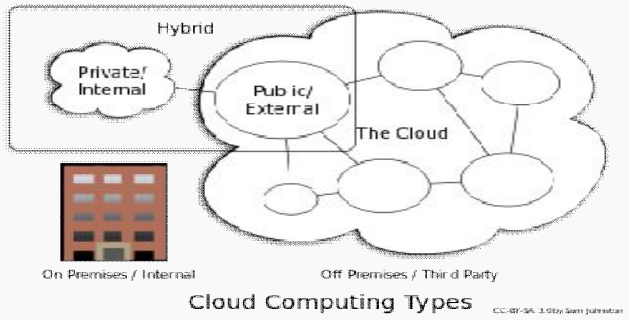

Fig. 4

  - Private cloud
  - Public cloud
  - Hybrid cloud
  - Others
    - Community cloud
    - Distributed cloud
    - Intercloud
    - Multicloud

- **Private cloud**

The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.

- **Public cloud**

The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services

- **Hybrid cloud**

The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load-balancing between clouds).

- **Others models**

  - **Community cloud**

The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on premise or off premise.

- **Distributed cloud**

A cloud computing platform can be assembled from a distributed set of machines in different locations, connected to a single network or hub service. It is possible to distinguish between two types of distributed clouds: public-resource computing and volunteer cloud.

Public-resource computing: This type of distributed cloud results from an expansive definition of cloud computing, because they are more akin to distributed computing than cloud computing.

Volunteer cloud: Volunteer cloud computing is characterized as the intersection of public-resource computing and cloud computing, where a cloud computing infrastructure is built using volunteered resources. Many challenges arise from this type of infrastructure, because of the volatility of the resources used to build it and the dynamic environment it operates in. It can also be called peer-to-peer clouds, or ad-hoc clouds.

- **Intercloud**

The Intercloud is an interconnected global "cloud of clouds and an extension of the Internet "network of networks" on which it is based. The focus is on direct interoperability between public cloud service providers, more so than between providers and consumers (as is the case for hybrid- and multi-cloud Multicloud.

IV. CLOUD COMPUTING FOR EVERYONE

Fig. 5

Cloud Computing for the Family Now that you know a little bit about how cloud computing works, let's look at how you can make cloud computing work for you. By that I mean real-world examples of how typical users can take advantage of the collaborative features inherent in web-based applications we'll start our real-world tour of cloud computing by examining how an average family can use web-based applications for various purposes. As you'll see, computing in the cloud can help a family communicate and collaborate—and bring family members closer together. [8]

- Centralizing Email Communications
- Collaborating on Schedules
- Collaborating on Grocery Lists
- Collaborating on To-Do Lists
- Collaborating on Household Budgets
- Collaborating on Contact Lists
- Collaborating on School Projects
- Sharing Family Photos
- THE COLLABORATIVE FAMILY

- **Cloud Computing for the Community**

Cloud computing isn't just for home users. It has tremendous benefits for the entire community, from neighborhood groups to sports teams to school organizations. Any time any group of people in the community needs to communicate and collaborate; web-based applications are the way to go. This chapter, therefore, takes a look at a few typical community uses of cloud computing. After examining the web based approach, it's hard to imagine going back to the old way of doing things. [9]

- Community Group Schedules
- Collaborating on Schedules
- Sports Team Schedules
- School Schedules
- Event Schedules and Management
- Collaborating on Group Projects and Events
- Collaborating on To-Do Lists
- Collaborating in Task Management
- Collaborating in Event Management
- Collaborating with Event Marketing

- **Cloud Computing for the Corporation**

Businesses have been some of the early adopters of cloud computing. Companies large and small recognize the cost savings and productivity enhancements of using web-based tools to manage projects collaborate on documents and presentations, manage enterprise wide contacts and schedules, and the like. Cloud computing lets companies do more with limited budgets.

With all that in mind, let's look at some of the many ways that companies and their employees can use cloud computing.

- Managing Schedules
- Managing Contact Lists
- Managing Projects
- Collaborating on Reports
- Collaborating on Marketing Materials
- Collaborating on Expense Reports
- Collaborating on Budgets
- Collaborating on Financial Statements
- Collaborating on Presentations

V. THE FUTURE

Many of the activities loosely grouped together under cloud computing have already been happening and centralized computing activity is not a new phenomena

- Grid Computing was the last research-led centralized approach.
- However there are concerns that the mainstream adoption of cloud computing could cause many problems for users.
- Many new open source systems appearing that you can install and run on your local cluster should be able to run a variety of applications on these systems. [10]

VI. CONCLUSION

Taken together, the 5 Parts in this paper provide an excellent overview of cloud computing. If you're not sure what cloud computing is yet, you will be when you get done reading this Issue.

The last question for us IS CLOUD COMPUTING NECESSARY?

The answer, of course, is not totally necessary. After all, you can easily use non cloud tools, such as instant messaging, to communicate with other members of your group. And, if your group is 100 percent internal to your company, there's no reason to venture into the cloud at all assuming you always have access to your company's network, of course.

But if you want to include people from outside your organization in your group, or if your group is spread out between multiple locations, or if members of your group travel or work from home, then incorporating some cloud-based tools makes a lot of sense. When you're out of the main office, it's a lot easier to log on to a cloud website than it is to try to remotely tunnel into your company's network.

That's not to say that pure cloud technology is always necessary. Your application and documents could just as easily be hosted on the hosting provider's servers; they don't have to be "in the cloud," per se. That said, as applications become bigger and more powerful, and as the need for huge amounts of storage continues to increase, the advantages of sharing cloud resources become more explicit.

So even if your groupware and collaboration applications aren't yet hosted in the cloud, they probably will be sometime in the future. It's simply a lot more efficient to share space on hundreds or thousands of cloud computers than it is to keep buying more servers for your data center. That's the real reason why cloud computing will likely become ubiquitous; it provides more power and storage for less money than any other current computing solution.

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